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The International Comparison of Value Added, Productivity and Purchasing Power Parities in Agriculture*

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This study is part of the ICOP (International Comparison of Output and Productivity) project of the University of Groningen. It presents international comparisons of levels of value added, productivity and purchasing power parities (PPPs) in agriculture for 13 countries for 1975. An early version of this paper was issued in 1984 (Research Memorandum 162 of the Institute of Economic Research, Groningen). In 1985 a slightly revised version was given limited circulation. The present paper contains further revisions, makes an assessment of other studies in this field, confronts our results with those of Prasada Rao (1986 and 1992) and contains suggestions for further research.

I

Our Methodology and Its Relation to Other Studies

There were three stages in our procedure for estimating gross value added in agriculture.

a) We estimated the gross value of farm output from quantitative information on commodity production from FAO Production Yearbooks. We adopted a maximalist approach, including item headings for all products listed by FAO, and for some others for which we received supplementary FAO information. In this revised version of our estimates, wine is excluded as it is, in fact, a manufactured product and involved double counting. Thus we listed 149 potential product items (excluding wine) under 13 basic headings (cereals, vegetables, etc.) There were quite a few of these items for which FAO recorded no production in any of our 13 country sample, so a listing of 110 products (excluding wine) would have been adequate for our purpose. For China, 90 commodities were specified, the USA 84, Mexico 83, India 78, Brazil and Argentina 76, Japan 68, France 66, Korea 60, Germany 47, Indonesia 45, Netherlands and the UK 43 items.

The quantities were valued at US producer prices as given in FAO's Statistics on Prices Received by Farmers. For commodities which did not exist in the USA we used "shadow" US prices (derived from wheat or rice price relatives for 5 other countries) as well as some proxy prices. The proportionate importance of shadow and proxy pricing is indicated in the notes to Table 1.

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The quality and amount of market information was better in the USA than in most countries. There were very few price holes for the USA, i.e. commodities where we had production but no price information from FAO. We had prices for 81 US items compared with no prices for China, 30 for Indonesia, 40 for the UK, 44 Netherlands, 46 Germany, 49 Japan, 50 India, 53 Korea, 69 Argentina and Brazil, 75 France, 81 Mexico. Reliance on shadow pricing was minimised by having the USA as the benchmark. As the USA was the lead country in terms of productivity, its price structure seemed the most appropriate for analysing problems of convergence and catch-up which were our central concern. However, it would be useful to expand the analysis of the present data set to cover the full range of bilateral measures i.e. Paasche, Laspeyres and Fisher variants used in other ICOP studies for manufacturing as well as the Geary Khamis multilateral measures used by ICP abd FAO. This expansion of the present paper will be contained in Maddison and Prasada Rao (1993).

b) The second stage in our calculation was to deduct inputs of feed and seed, which we derived from FAO Food Balance Sheets and valued at the same price as the outputs.

c) The third step was to estimate non-farm inputs. Fertiliser and pesticide inputs were derived from FAO publications, energy inputs from OECD sources. These were revalued at prices paid by US farmers. Quantitative indicators for other inputs for administrative, veterinary, irrigation, insurance, repair and maintenance costs etc., were not available. Values of these inputs were assumed to have the same proportionate relation to the combined value of fertiliser, pesticide and energy input in US dollars as they did in national currencies (this is equivalent to assuming their PPPs to be the same). The relevant values in national currency were mostly taken from FAO and OECD "economic accounts" for agriculture.

Section II (below) provides a summary of the methods used in 9 other studies as well as the two earlier versions of the present study. These studies have a strong "family" resemblance. Our own 1984/5 work was most strongly influenced by Paige and Bombach (1959) and Maddison (1970). In this revision we have paid particular attention to the lessons that can be derived from Prasada Rao (1986 and 1992) and van der Meer and Yamada (1988 and 1990).

All the studies summarised in Section II attempted to estimate value added. In some cases the allowance for non-agricultural inputs was crude as in Maddison (1970), Hayami and Ruttan (1971) and Prasada Rao (1986 and 1992). Terluin did not attempt to deduct for non-agricultural services. The most detailed attempt to measure inputs was in the van der Meer and Yamada studies (1988 and 1990); they also deducted depreciation (as did Mensink) in order to estimate net value added.

All the studies measured output of two or more countries in a common set of prices (purchasing power parities - PPPs). In binary studies, the PPPs were shown at own country and other country quantity weights (Paasche and Laspeyres variants). In multilateral studies, practice has varied. We showed our results in terms of US prices (Paasche PPP) and offered 6 other national price variants. Prasada Rao (1986 and 1992) used the multilateral Geary Khamis PPP procedure favoured by the United Nations International Comparison Project, which is a weighted average price system for all countries in the comparison which is meant to approximate to average world prices. This price system is transitive and in invariant to choice of base country. Terluin used the Gerardi PPP procedure, which has similar properties, but gives equal weight to all the EC countries involved in her comparison, whereas the Geary Khamis variant gives weights according to the relative size of farm output in the countries considered. Hayami and Ruttan used a hybrid procedure - a geometric average of Japanese, Indian and US prices for measuring gross output, and a geometric average of Japanese and US prices for inputs. Our own preference is for simple, transparent, weighting systems, but, in future studies we would favour presenting as wide a range of alternative price systems as is feasible, because the array of different possible answers provides useful analystical information.

Most of the studies derive their measure of the value of gross output from detailed price and quantity information for individual commodities. Van der Meer and Yamada use a different approach in their binary comparison of Japan and the Netherlands. One might term it the "accounts" approach as distinct from our "commodity" approach. They start with value aggregates from the "economic accounts" for agriculture, and deflate them by a composite price index to get an indirect measure of comparative output volume on a highly aggregate basis (with a threefold breakdown for crops, livestock, and horticultural products). Terluin used a similar procedure.

Most binary comparisons have made some kind of coverage adjustment for items not included in their detailed commodity specification. The van der Meer - Yamada approach involves an implicit coverage adjustment in that their value aggregates are comprehensive in coverage, whereas the commodities included in their composite price index are limited to 88/89 items. Implicitly they assume that the inter-country price variance for non covered items is the same as the average for covered items. None of the multilateral studies (except that of Terluin, whose procedure is similar to that of van der Meer and Yamada) made an adjustment for non covered items, i.e. they define the boundaries of agriculture in terms of the array of commodities they are able to specify and measure. Implicitly, they assume that the inter-country quantity variance for non-covered items is the same as the average for covered items. The equiprice coverage adjustment is preferable to the equiquantity assumption, but it is not easy to judge what the coverage adjustment should be, unless more detailed information is available than in the case of FAO and OECD economic accounts for agriculture.

The data available in internationally comparable form from FAO on quantity and price of agricultural products are much richer than those for manufacturing in UNIDO statistics. The structure of commodity output and inputs in agriculture is very much simpler than that in manufacturing, and FAO (together with its predecessor, the International Institute for Agriculture) has been working towards data standardisation and enhanced international comparability for nearly 70 years. It is quite striking that none of the cross country comparisons listed in Section II was based on agricultural censuses, because of the wealth of information from secondary sources. This is in contrast with the situation for manufacturing, where the ICOP programme has relied almost exclusively on census material. In manufacturing, there are major problems in making matches for products which vary in quality and specification, whereas these problems can and have been largely ignored in agricultural comparisons. None of the agricultural studies makes any adjustment for intercountry variation in the quality of products.

II

Summary Description of Previous Studies of Agricultural Value Added, Productivity, and/or PPPs

PAIGE and BOMBACH (1959). 2 Countries. 62 Farm Products.
(Part of gross value added, labour productivity and PPP comparison for total GNP in UK/USA 1959)

Individual products in each country were weighted by own prices and other country prices to produce Paasche and Laspeyres output estimates. Where British prices were missing, e.g. for tobacco, corn and citrus fruit, import prices were used. UK output data were available net of feed and seed. Some minor use of coverage adjustments with both equiprice and equiquantity assumptions. No quality adjustments. End result adjusted to a national accounts basis, i.e. agricultural contribution to gross national product. Fishery output measured crudely by total weight of fish catch. No mention of forestry. Productivity measured in terms of output per "worker". Official UK and US sources.

MENSINK (1966). 2 Countries. 35 Farm and Horticulture Products.
(Part of comparison of net value added and labour productivity in manufacturing and agriculture UK/Netherlands 1958/9)

Similar to Paige and Bombach, showing Paasche and Laspeyre variants. Greater use of coverage adjustment for non-specified products. All such adjustments were on an equiprice basis. No quality adjustments. Paasche and Laspeyres comparisons were shown. End result more or less on a national accounts basis, with a rough adjustment for depreciation. Butter and cheese processing treated as part of agriculture. Productivity measured in terms of output per man year. Sources were UK official publication and Dutch CBS files.

MADDISON (1970). 29 Countries. 89 Farm Products, 3 Fishery and 4 Forestry Products.
(Part of industry of origin comparison of gross value added, and labour productivity for GDP at factor cost in 1965)

Similar to Paige and Bombach. All estimates at US prices (FAO North American wheat relatives converted into dollars). Commodity quantities from FAO sources. Detailed information on non-farm inputs was available only for a few countries, so fertiliser inputs were used as a proxy in most cases to arrive at estimate of agricultural contribution to GDP at factor cost. Productivity measured in terms of output per person engaged. Also included estimates of food consumption.

HAYAMI and RUTTAN (1971). 43 Countries. 53 Farm Products.
(Estimate of farm output, net of feed and seed, and approximate gross value added 1957-62)

Individual product output, feed and seed inputs for each country weighted by FAO wheat price relatives for India, Japan and USA. Composite indicator derived as geometric average of 3 weighting systems. No coverage or quality adjustments. Crude measures of gross value added using benchmark data on non-farm inputs in Japan and USA; inputs in other countries proxied by fertiliser use and stock of farm machinery; composite indicator of these inputs using geometric average of 2 weighting systems. Hayami and Ruttan were rather dubious about the quality of their value added estimates and used their gross output benchmark for intertemporal extrapolation. In the 1985 update of their book the attempt to measure gross value added was dropped.

SMITH, HITCHENS and DAVIES (1982). 3 Countries. 38 Farm Products.
(Part of comparison of gross value added and labour productivity in commodity producing sectors, UK/USA, UK/Germany in 1974)

Paasche and Laspeyre quantity comparison. Seems to have involved weighting of commodities by prices of each country, with some use of shadow prices and coverage adjustments. No adjustment for quality. Forestry and fishing measured roughly. Fertiliser input adjusted by FAO price data, other inputs adjusted by output prices. Official national sources were used.

VAN OOSTSTROOM and MADDISON (1984 and 1985). 14 Countries. 150 Farm Products.
(Estimate of gross value added, land and labour productivity and producer PPPs for agriculture, forestry and fishing in 1975)

Quantities of individual commodities, feed and seed inputs, were weighted by US prices. No adjustment for coverage or quality. Four categories of non-farm inputs were measured, fertilisers, pesticides, energy and service inputs. Energy input measured by proxy. Service inputs by value ratios in national currencies. Paasche PPPs shown only for gross value of farm output, productivity in terms of land and persons engaged. Material nearly all from FAO. The 1985 paper was a revised and expanded version of the 1984 study with 11 appendices instead of 5, with revised estimates of feed and seed inputs, minor modification in the measure for service inputs, and improved estimates for forestry. Paasche PPPs shown for gross output, total inputs and gross value added. Supplementary estimates were presented for output of grass and hay, dung, the increment in livestock herds and food consumption levels.

PRASADA RAO (1986). 95 Countries. 173 Farm Products.
(Estimate of gross value added, labour productivity and Geary-Khamis PPPs for 1970, 1975 and 1980)

Quantities of individual commodities, feed and seed inputs, were weighted by Geary-Khamis average world prices (using price data for all 95 countries). No coverage or quality adjustment. Non-farm input values from FAO farm accounts were divided by Geary-Khamis fertiliser prices as a proxy for all input prices. The 29 country input proxy was regressed against 6 variables representing levels of development, and reproxied for a further 53 countries for which the 6 indicators were available. Rough estimate of gross value added presented for 82 countries (for 13 communist countries, the reproxying procedure not feasible).

VAN DER MEER and YAMADA (1988 and 1990). 2 Countries. 3 Product Groups, deflated by composite interspatial Paasche and Laspeyres price indices.
(Full binary Comparison Japan/Netherlands of net value added, land and labour productivity for 1975. Rough quadrilateral comparison including Taiwan and USA. Supplementary 26 country comparison of gross value added (1975) adjusting FAO (1986) estimates by input value ratio from farm accounts at national prices)

They derive price indices for three categories of farm output, (arable crops, horticulture and livestock), for 9 Japanese and 12 Dutch input categories, and for depreciation. These are then applied to the corresponding value estimates from the farm accounts to derive intercountry comparisons of the volume of output and input. The results are generally shown on both a Paasche and Laspeyres basis. For Japan 88 product prices were used, for the Netherlands 89. The Netherlands does not produce rice, so the Italian rice/wheat price ratio was used as a Dutch shadow price. As rice had a weight of 34 per cent in the Japanese price index, this procedure had a large effect on their results. Their method involves an implicit, equiprice, coverage adjustment. Labour productivity is measured in man hours, and they also show land productivity. The basis for the Taiwan and US comparisons is not very clearly described. All their comparisons are reviewed in the context of developments since 1880, with some merger of time series and benchmark estimates.

TERLUIN (1990). 9/10 Countries. 20 Product Groups deflated by composite Gerardi interspatial price indices.
(Estimate of farm output, inputs except services, and surrogate gross value added - without deduction for service inputs, 9 EC countries for 1975, 10 for 1980 and 1985)

Gerardi price indices are applied to values from Eurostat economic accounts for 14 groups of crop products, 6 livestock groups, and 3 types of input (fertiliser, feeding stuffs and energy) to get a surrogate valuation of gross value added. PPPs for output and input are shown in units of national currency per ECU. Outputs and inputs are also repriced using Eurostat's 1985 Gerardi PPPs for GDP, with backward extrapolation of these parities to 1975 and 1980 (the method by which the extrapolation was made is not explained, but the GDP PPPs for 1975 and 1980 are different from Eurostat's earlier set of such PPPs for 1975 and 1980).

PRASADA RAO (1992). 103 Countries. 185 Farm Products.
(Estimate of gross value added, labour productivity and Geary Khamis PPPs for 1985. New estimates of gross output, feed and seed inputs for 1970, 1975, 1985, and 1990, together with corresponding Geary Khamis PPPs).

Procedure similar to that in (1986) study, except that feed and seed input prices are different from output prices. Prices are again expressed with the US dollar as the numeraire, but also in a new composite agricultural commodity unit (ACU).

III
Gross Value of Farm Output

Gross value for each product was calculated by multiplying production quantities by "prices received by farmers" (at the "farm gate", or first point of sale), excluding indirect taxes and subsidies. The sum of these is the gross value of farm output.

It can be seen from table 1, that in 1975 agricultural products were very cheap in Argentina, relatively cheap in Brazil, India, and Indonesia. The opposite was the case for Korea, Mexico, France, Germany, Japan, Netherlands and the U.K. In the latter cases the exchange rate conversions would exaggerate the real output of the countries concerned in 1975, whereas in the former countries real output would be understated by such a procedure.

Table 1
Gross Value of Farm Output, Purchasing Power Parities and Price Levels in 1975

	(1) Gross Value at US plus shadow and proxy US Prices (mln. $)	(2) Gross Value at Country's own Prices (mln. national currency units	(3) Paasche Purchasing Power Parities: Units of National Currency per US $	(4) Exchange Rate Units of National Currency per US $	(5) Producer Price Level Relative to USA (PPP : Exchange rate)
Argentina	11,316	148,653	13.18	36.57	36.0
Brazil	23,600	173,311	7.34	8.127	90.3
China	112,960	n.a.	n.a.	1.86	n.a.
India	49,104	404,993	8.25	8.653	95.3
Indonesia	10,480	3,734,909	356.38	415.0	85.9
Korea	3,348	2,294,940	685.47	484.00	141.6
Mexico	9,042	121,712	13.46	12.50	107.7
France	21,649	118,471	5.47	4.29	127.5
Germany(FR)	15,843	51,174	3.23	2.46	131.3
Japan	12,505	8,721,990	697.48	296.79	235.0
Netherlands	5,912	17,881	3.02	2.53	119.4
U.K.	9,999	4,926	0.49	0.45	108.9
U.S.A.	92,863	92,863	1.00	1.00	100.0

n.a. = not available

Sources: Van Ooststroom and Maddison (1985). First and second columns derived from FAO, Production Yearbooks for quantities, and FAO, Statistics on Prices Received by Farmers, FAO, Rome, 1982 for prices. In the first column, the valuations are at US prices or where there was no US price available, we used proxy or shadow US prices. The proxy/shadow component of the US valuations in the first column was 17.9 per cent for Argentina, 6.4 per cent for Brazil, 1.8 per cent for China, 14.3 per cent for India, 16.3 per cent for Indonesia, 1.1 per cent for Korea, 4.5 per cent for Mexico, 1.1 per cent for France, 0.3 per cent for Germany, 1.7 per cent for Japan, 0.2 per cent for the Netherlands and the UK and 0.1 per cent for the USA. In the second column, there is also a significant element of shadow pricing because there were items where production was reported by FAO, but FAO supplied no prices for the product in that country. These "holes" in our national price information were biggest for Indonesia. There were also cases of redundant prices, i.e. FAO prices were available in some cases for products not produced in the country. The third column was derived by dividing column 2 by column 1. Fourth column from IMF International Financial Statistics. Fifth column derived by dividing column 3 by column 4.

Table 2
Value of Feed and Seed Inputs in 1975

	Seed Input at US prices (mln $)	Feed Input at US prices (mln $)	Feed as % of live-stock output (%)
Argentina	184	1,238	23.6
Brazil	369	2,630	38.4
China	2,389	11,193	43.5
India	2,052	3,170	55.2
Indonesia	96	270	42.9
Korea	43	259	57.3
Mexico	74	1,102	36.8
France	232	4,856	40.0
Germany	229	5,429	51.7
Japan	119	2,197	44.5
Netherlands	58	1,269	44.3
U.K.	165	2,050	29.3
U.S.A.	1,265	15,701	38.5

Sources: van Ooststroom and Maddison (1985).

Table 3
Value of Farm Output Net of Feed and Seed in 1975

	Value at US (plus shadow and proxy US) Prices $ million	Value in National Prices million national currency units	Paasche PPP
Argentina	9,894	132,887	13.43
Brazil	20,601	151,148	7.34
China	99,378	n.a.	n.a.
India	43,882	358,975	8.18
Indonesia	10,114	3,612,423	357.17
Korea	3,046	2,092,442	686.95
Mexico	7,866	102,248	13.00
France	16,561	92,986	5.61
Germany	10,185	33,873	3.33
Japan	10,189	6,816,961	669.05
Netherlands	4,585	13,877	3.03
UK	7,784	3,858	.496
USA	75,897	75,897	1.00

Source: Derived from Tables 1 and 2. See notes to Table 1.

The Cost of Inputs and the Derivation of Gross Value Added

In order to arrive at value added we must deduct inputs. It is convenient to distinguish:

a. Inputs of agricultural products, i.e. feed and seed,
b. Inputs of goods purchased from outside agriculture, i.e. fertilizers, pesticides, fuel, lubricants and electricity,
c. Inputs of services supplied from outside agriculture, i.e. maintenance and minor repairs of fixed capital assets, rentals of machinery and equipment, overhead and other costs.

(a) Agricultural Inputs

Agricultural items which we deducted included feeding stuffs for livestock used during the reference period, eggs for hatching and crop items used for seed.

The F.A.O. Food Balance Sheets, 1975-77 Average (1980), provide data on feed and seed, whether domestically produced or imported for 1975-77. F.A.O. kindly provided the figures for 1975 from their basic data files. These 1975 feed and seed input quantities were valued by the same prices as we used for gross output.

Table 2 shows the value of feed and seed inputs. Hay, green feed, silage, and grass for grazing are excluded from the FAO production statistics and for that reason are not included in either our agricultural input or our gross output measure. However, the relative availability of these items helps to explain some of the intercountry variation in inputs of feeding stuffs. Argentina´s large area of lush grass obviously helps to explain its relatively low feed ratio.

Table 3 shows the value of farm output net of feed and seed in 1975. It is derived by deducting the inputs shown in table 2 from the gross value of physical output shown in table 1: the results are shown in terms of US relative prices and at national prices, together with the implicit PPPs, which are very close to those in table 1.

(b) Identifiable Inputs of Goods Purchased Outside Agriculture

Fertilizer inputs were taken from the 1978 F.A.O. Fertilizer Yearbook (1979). They are given in metric tons of plant nutrients of nitrogen(N), phosphate(P205) and potash(K20). The fertilizer registration year covers the period starting and ending the first of July. We therefore averaged 1974/75 and 1975/76 consumption to derive the estimate for 1975. F.A.O. does not quote a U.S. price for each type of fertilizer, so we estimated average prices for three groups of fertilizers (nitrogenous, phosphate and potash) using quantities consumed in the U.S.A. as weights. In this manner we determined the average unit value of nitrogenous fertilizers (440 U.S. dollars per metric ton), phosphate fertilizers (454 U.S. dollars per metric ton) and potash fertilizers (182 U.S. dollars per metric ton).

Figures on consumption of pesticides are from the 1977 F.A.O. Production Yearbook (1978). A quantity ratio relative to the value of U.S.

consumption of chemical products was applied, to obtain the value of chemical product consumption in the other countries. Our source did not give pesticide inputs for Brazil, China, Japan, Netherlands and the U.K.. For Brazil we used the figure for 1977 as given in Brasil Series Estatisticas Retrospectivas (1977). Pesticide use in China was assumed to be the same per hectare of agricultural land as in India and it was assumed that the average pesticide input coefficient of France and Germany was valid for Japan, the Netherlands and the U.K..

Energy inputs in equivalent tons of oil are available from the International Energy Agency (see Energy Balances of OECD Countries 1970-1985, Paris, 1987 for OECD countries, and World Energy Statistics and Balances 1971-1987, Paris, 1988 for non-OECD countries). These were converted into dollars at US prices from data on the value of US agricultural energy consumption in the OECD economic accounts for US agriculture.

(c) Other Inputs

It was not possible with the information we had, to identify specific inputs of administrative, veterinary, irrigation, insurance and other services and costs of repair and maintenance of fixed capital assets in quantifiable terms. As a proxy we took the ratio of the aggregate value of these inputs to inputs of fertilizer, pesticides and energy as recorded in the "economic accounts" in national prices. Our sources were the replies to the F.A.O. Questionnaire on Economic Accounts for Agriculture, 1980/81, for

Table 4
Value of Non Agricultural Inputs into Agriculture in 1975 at U.S. Relative Prices
(millions of 1975 U.S. dollars)

	Fertilizers ($ mln)	Pesticides ($ mln)	Energy ($ mln)	Other Non-agricultural Inputs ($ mln)	Total Non Agricultural Inputs ($ mln)
Argentina	29	47	337	548	961
Brazil	715	73	361	1,149	2,298
China	2,512	270	562	538	3,882
India	1,130	122	401	266	1,919
Indonesia	212	1	a	270	483
Korea	340	15	2	165	522
Mexico	460	45	474	863	1,842
France	1,730	140	778	1,831	4,479
Germany(FR)	1,117	66	591	1,435	3,209
Japan	712	26	668	1,214	2,620
Netherlands	254	10	283	691	1,238
U.K.	679	86	501	1,321	2,587
U.S.A.	6,599	1,780	3,918	16,619	28,916

a) included in fourth column.
Source: As described in text.

Table 5

Value of Inputs at National Prices
(million units of national currency)

	Feed	Seed	Fertiliser	Pesticides	Energy	Services & Other Inputs
Argentina	13,196	2,570	5,718	a	815	8,673
Brazil	18,486	3,677	5,398	a	1,989	7,387
India	29,474	16,544	17,249	3,625	9,919	4,957
Indonesia	86,127	36,359	38,600	a	b	428,000
Korea	176,730	25,768	89,990	41,990	120,150	116,450
Mexico	18,365	1,099	5,777	2,809	2,467	9,740
France	24,385	1,100	8,103	3,342	3,010	9,993
Germany	16,478	823	3,417	585	3,125	5,766
Japan	1,839,413	65,620	612,000	282,000	198,000	943,000
Netherlands	3,787	217	660	160	510	1,680
UK	982	86	342	87	187	643
USA	15,701	1,265	6,599	1,780	3,918	16,619

a) included with fertilisers; b) included in last column.

Source: First two columns derived by multiplying FAO quantity figures by FAO prices (or our shadow prices, where relevant). For Argentina and Brazil, input/output tables were used for fertilisers, energy and other inputs. Other entries were generally derived from economic accounts for agriculture.

India, Korea and Mexico; input/output tables for Argentina, and national accounts for Brazil. For China we assumed the ratio to be the same as in India. For OECD countries,non agricultural inputs in national prices were taken from OECD, Economic Accounts for Agriculture 1975-1987, Paris, 1990.

d) Total Inputs

Total inputs in US prices are shown in tables 2 (for feed and seed) and 4 (for non-farm inputs). Table 5 shows the value of farm inputs in national currencies.

e) Gross Value Added

Table 6 shows gross value added in farming in US prices which was derived from Tables 1, 2 and 4. Gross value added is also shown in national prices together with the Paasche PPP for value added which is derived by dividing column 2 of Table 6 by column 1. The last column of Table 6 shows the Paasche PPP for non-agricultural inputs.

Table 6
Gross Value Added in 1975 in US Prices, in National Prices and the Paasche PPPs for Gross Value Added and Non-Agricultural Inputs

	Gross Value Added at US Prices (Million $)	Gross Value Added in million National Currency Units	PPP for Gross Value Added Units of National Currency per $	Non-Agricultural Inputs at US Prices (Million $)	Non-Agricultural Inputs in Million National Currency Units	PPP for Non-Agricultural Inputs
Argentina	8,933	117,681	13.17	961	15,206	15.82
Brazil	18,303	136,374	7.47	2,298	14,774	6.42
China	95,496	n.a.	n.a.	3,882	n.a.	n.a.
India	41,963	323,225	7.70	1,919	35,750	18.63
Indonesia	9,631	3,145,823	326.64	483	466,600	966.05
Korea	2,524	1,723,862	682.99	522	368,580	706.09
Mexico	6,024	81,455	13.52	1,842	20,793	11.29
France	12,082	68,538	5.67	4,479	24,448	5.46
Germany	6,976	20,980	3.01	3,209	12,893	4.02
Japan	7,569	4,781,961	631.78	2,620	2,035,000	776.72
Netherlands	3,347	10,867	3.25	1,238	3,010	2.43
UK	5,197	2,599	.50	2,587	1,259	.487
USA	46,981	46,981	1.00	28,916	28,916	1.00

Source: Derived from Tables 1, 2, 4 and 5. US prices means US plus US shadow and proxy prices.

V

Comparative Levels of Economic Performance in Agriculture

Table 7 provides some of the major indicators of comparative levels of performance in agriculture, which can be derived from our estimates of gross output and value added, when they are considered in relation to employment, land availability and population.

Column 1 shows clearly that the USA is the world productivity leader in agriculture. The Netherlands was the only close competitor at 90 per cent of the US level. The UK was in third place with only 55 per cent of US productivity. Argentina came next but had less than half the US level. Some countries with high levels of performance in manufacturing had poor performance in agriculture. French farm productivity was 40 per cent of that in the USA. German farm productivity was less than a third of that in the USA. Japanese productivity was abysmal at only 8.8 per cent of the USA. India had the worst performance at 1.9 per cent of the US level, and performance in China and Indonesia was not much better.

A major reason for US productivity leadership in agriculture is its abundant supply of land. In terms of land productivity, US performance is only one fourteenth of that in the Netherlands. In fact the only countries with lower levels of land productivity than the USA were Argentina, Brazil and Mexico.

Table 7

Comparative Performance in Agriculture in 1975

	Gross Value Added Per Person Engaged	Gross Value Added Per Hectare of Agricultural Land	Gross Value Added Per Head of Population	Utilisation of Agricultural Products Per Head of Population	Agricultural Employment 000s	Area of Agricultural Land 000 ha.
Argentina	43.9	48.0	157.7	74.9	1,389	170,550
Brazil	10.0	81.7	80.2	44.5	12,468	205,001
China	2.3	218.2	47.9	33.0	281,378	400,710
India	1.9	212.4	31.4	21.5	147,936	180,858
Indonesia	2.4	275.6	33.3	20.6	27,400	31,996
Korea	3.6	1,015.5	32.9	30.4	4,831	2,272
Mexico	6.7	56.1	46.0	40.1	6,134	98,339
France	39.8	341.9	105.4	106.1	2,074	32,357
Germany	30.1	511.1	51.9	102.2	1,585	12,496
Japan	8.8	1,243.5	31.2	39.9	5,870	5,573
Netherlands	90.0	1,441.4	112.6	72.7	254	2,126
UK	54.7	256.1	42.5	81.7	649	18,583
USA	100.0	100.0	100.0	100.0	3,208	430,158

Source: The first two columns are derived from the last two columns and from Table 6. Column 3 from Table 6 divided by population. Fourth column derived from Table 8. Employment in India, Indonesia, Korea and Japan from van der Meer and Yamada (1990), p.175; China from Statistical Yearbook of China 1984, Hong Kong, 1984, pp.104 and 109. For other countries, the available employment figures included forestry and fishing; we excluded forestry and fishing for France, Germany and the Netherlands by using indications of their share in employment for neighbouring years. For the other five countries we assumed productivity in agriculture to be the same as in agriculture, forestry and fishing. Employment for OECD countries from Labour Force Statistics and National Accounts, OECD, Paris. Employment in Latin American countries was supplied by ECLAC. Land area from Prasada Rao (1992), Table 5.101.

Table 8
Domestic Utilisation of Farm Products in 1975

	Gross Value of Farm Output	Imports	Exports	Domestic Utilisation	Per Capita Domestic Utilisation
	----------------	million dollars		----------	$
Argentina	11,316	485	4,520	7,281	2,795
Brazil	23,600	1,367	7,545	17,422	1,661
China	112,960	2,323	2,498	112,785	1,231
India	49,104	2,119	2,031	49,193	802
Indonesia	10,480	872	1,106	10,246	770
Korea	3,348	873	216	4,005	1,135
Mexico	9,042	673	717	8,998	1,496
France	21,649	6,797	7,588	20,857	3,958
Germany (FR)	15,843	11,537	3,807	23,574	3,813
Japan	12,505	4,247	140	16,613	1,490
Netherlands	5,912	4,622	6,830	3,703	2,710
UK	9,999	10,480	3,347	17,132	3,048
USA	92,863	10,149	22,459	80,553	3,730

Source: Column 1 from Table 1. Imports and exports from FAO, Trade Yearbook, 1977 (1978), converted to dollars with our PPP converters in Table 1, except for China where we had no PPPs and used the exchange rate. Domestic utilisation equals output, plus imports, minus exports.

It would, of course, be desirable to supplement our productivity measures by estimates of the stock of physical capital and human capital (education and skills embodied in the labour force). With such information we would be able to make estimates of total factor productivity which would give better insight into the efficiency of agriculture in the different countries.

As agriculture supplies basic necessities for human subsistence, it is clear that low productivity countries have to offset their low agricultural productivity by keeping large fractions of their population in agricultural employment. In the USA, only 1.5 persons per 100 members of the population are engaged in agriculture, whereas in China the figure is 31 and India 24. The only country with a lower ratio is the UK where only 1.2 persons are in agriculture per 100 members of the population. The UK has had the lowest ratio of farm employment over the past 150 years since it embraced free trade in 1848, and for this reason it is a big net importer of agricultural products.

The third column of Table 7 shows gross value added per head of population. This was biggest in Argentina which is proportionately the biggest net exporter of agricultural products. France and the Netherlands also had bigger ratios of value added per head of population than the USA, and were also net exporters of agricultural products. Gross value added per head of population was lowest in Japan.

The fifth column of Table 7 shows total utilisation of agricultural products per head of population. Utilisation is equal to gross output as shown in our Table 1 adjusted for the net balance on foreign trade in agricultural products (as derived from the FAO Trade Yearbook). Here we can see that France and Germany were the only countries with higher per capita utilisation than the United States. The lowest utilisation levels were in the poorest countries, India and Indonesia, but they were also remarkably low in Japan. It should be remembered that utilisation levels are not a good index of food consumption as agriculture includes items like tobacco, textile fibres, hides and skins. Furthermore, fish are an important source of food, particularly in Japan (see appendix A on forestry and fishing output).

VI

Comparison of Our Results with those of Other Recent Studies

a) Prasada Rao (1986 and 1992)

It is interesting to compare our results with those of Prasada Rao (1986 and 1992), as his sources and a good deal of his methodology were similar to ours.

In fact, his results for gross agricultural output are not very different from ours, as can be seen in Table 9. The major exception to this was China, where our estimate was over 40 per cent higher than his, for reasons which will not be clear until we can compare his detailed worksheets with ours.

There are two main differences between his studies and ours. The least significant is probably the difference in commodity coverage. He specified a potential 173 commodities in the 1986 study and 185 in 1992, which may account for the fact that his 1992 results are generally somewhat higher than those of 1986 (though not for China, Korea and Japan). We specified 149 commodities which should have produced slightly lower figures than his. The difference would not be too large as we included some generic residual items (e.g. cereals not elsewhere specified). The de facto differences in our coverage of production were small. We both excluded production of grass, hay and dung, and we both measured animal production for meat in terms of meat slaughterings (valued at prices received by farmer). It is clear on inspection of updated FAO worksheets that there were some revisions in FAO production statistics Prasada Rao used but none of those were very dramatic.

Prasada Rao valued farm output at "Geary Khamis international" prices, which could be expected to produce lower values than with our US and US proxy/shadow prices (Paasche PPPs). There is a persistent and very general tendency of this kind (the Gerschenkron effect) which can be observed in those ICP studies where the impact of different price systems can be observed. For OECD countries the Paasche GDP PPPs tend to produce a measure of output volume about 7 per cent higher on average than the Geary Khamis PPPs. His 1986 results (excluding China) averaged about 5 per cent lower than ours and in his 1992 study the corresponding average was 3 per cent lower. This type of discrepancy between the Paasche and the Geary-Khamis approaches is more or less what we might expect. However, it would clearly be useful for FAO to augment its future estimates by publishing results on a Paasche and Laspeyres basis as well as the Geary-Khamis results.

For gross value added in 1975, Prasada Rao's 1986 estimates differed from ours in both positive and negative fashion, with a range of the ratios from .82 to 1.28 (excluding China, for which he did not calculate value added). In Table 10 one can see what were the main identifiable differences between his studies and ours, as far as inputs are concerned. Our feed and seed estimates were significantly higher than his, by a ratio which varied from 1.2 for the USA to 3.4 for the Netherlands, with an average for the 13 countries of 1.9 for his 1986 study. His 1992 study showed higher feed and seed inputs in all cases; they were much closer to our estimates with a range from 1 in Indonesia, Japan and the USA to 1.6 for Germany, and an average difference in the ratio for these inputs of 1.2.

Table 10 also shows the difference between his 1986 estimate for non-agricultural inputs and our figures. There is a wide range of discrepancies with the ratio of the two estimates ranging from .3 for India to 3.2 for Korea. Unfortunately his 1992 study did not show a revised estimate of these inputs for 1975.

Table 9

Comparison of Our Estimate of Gross Output and Gross Value Added in Agriculture and those of Rao for 1975

	Rao (1986) (million Geary Khamis $)	Rao (1992) (million Geary Khamis $)	Our Estimate (million Paasche $)	Ratio of Our Estimate to that of Rao(1986)	Ratio of Our Estimate to that of Rao (1992)	Rao (1986) (million Geary Khamis $)	Our Estimate (Million Paasche $)	Ratio of Our Estimate to that of Rao
	Gross Farm Output					Gross Value Added		
Argentina	11,377	11,500	11,316	0.99	0.98	9,551	8,933	0.94a
Brazil	21,721	22,234	23,600	1.09	1.06	18,122	18,303	1.01a
China	80,264	79,277	112,960	1.41	1.43	n.a.	95,496	n.a.
India	47,294	48,287	49,104	1.04	1.02	38,837	41,963	1.08
Indonesia	8,981	9,827	10,480	1.17	1.07	8,601	9,631	1.12a
Korea	3,244	3,141	3,348	1.03	1.07	2,956	2,424	0.82a
Mexico	8,331	9,387	9,042	1.09	0.96	4,757	6,024	1.27
France	21,450	21,632	21,649	1.01	1.00	10,833	12,082	1.12
Germany	14,920	15,073	15,843	1.06	1.05	6,432	6,976	1.08
Japan	12,484	12,245	12,505	1.00	1.02	5,906	7,569	1.28
Netherlands	5,297	5,313	5,912	1.12	1.11	3,646	3,347	0.92
UK	9,409	9,521	9,999	1.06	1.05	5,976	5,197	0.87
USA	91,350	91,758	92,863	1.02	1.01	56,626	46,981	0.83

a) For these countries, Prasada Rao's estimate of non-agricultural inputs was extremely rough.

Source: Prasada Rao (1986), pp.31 and 46, (1992), Table 5.4. Our estimates from Tables 1 and 6 above. Prasada Rao (1992) did not contain estimates of 1975 value added.

It seems clear that the biggest reconciliation problem concerns the measurement of non-agricultural inputs and this is the area where further research would probably be most fruitful. We regard our method as preferable to that of Prasada Rao because it involves more detailed specification of the components of these inputs. However, this does not mean that our ratios are necessarily better than his, as he had better information than we had, and there is plenty of scope for error in our procedures.

Table 11 provides a rough guide to the plausibility of the different ratios. It shows our ratio of gross value added to gross output in US prices and Prasada Rao's ratio in Geary Khamis prices. Column 3 shows our estimate of the ratio in national prices. This is a hybrid measure, because our measure of gross output, feed and seed inputs is derived from our "commodity" approach, whereas the valuation of non-agricultural inputs was predominantly from the economic accounts for agriculture. The fourth column is the ratio shown by van der Meer and Yamada (1990) relying entirely on the "accounting" approach in national prices. All the van der Meer Yamada ratios, except that for Brazil, are closer to our results than to those of Prasada Rao. All of our national price ratios are nearer to our US dollar estimate than to Prasada Rao except for India and Germany.

Prasada Rao presents estimates of land and labour productivity. As we used his estimates for land, the differences in land productivity between his estimates and ours are attributable entirely to the reasons already discussed. In the case of employment, his estimates are invariably higher than ours, and may perhaps refer to persons engaged in forestry and fishing as well as agriculture. Our figures for employment are more or less the same as those of van der Meer and Yamada.

b) Van der Meer and Yamada (1990)

Van der Meer and Yamada made two kinds of estimate. The closest of these to our work was their estimate of gross value added, land and labour productivity for 26 countries (chapter 3 and appendix B of their book). For 1975, they simply used the gross value estimates of Prasada Rao (1986) in Geary Khamis international dollars and multiplied them by the ratios of gross value added to gross value which they derived from "economic accounts" for agriculture (see last column of our Table 11). Their value added estimate is therefore of a hybrid character as the output and inputs are calculated in different price systems. Furthermore, they assume that the basic ingredients (i.e. price and quantity measures) in the economic accounts are compatible with those in the "commodity" approach.

The second part of the Van der Meer and Yamada study is a very detailed binary comparison of value added in the Netherlands and Japan, which they supplement with a rougher estimate on the same lines for the USA and Taiwan. This part of their work contains some important innovations.

An important difference between our study and that of van der Meer and Yamada is that we measure gross value added, whereas they deducted depreciation to arrive at net value added. Their procedure here is in line with their general methodology. They deflate the value of depreciation as recorded in the national sector accounts by an interspatial price index for costs of building and prices of farm machinery. In the case of depreciation there is likely to be more variation of a misleading kind between valuations

Table 10
Comparison of Our Estimate of Inputs in Agriculture
and those of Rao for 1975

	Rao (1986) (mln. Geary Khamis $)	Rao(1992) (mln. Geary Khamis $)	Our Estimate (million Paasche $)	Ratio of Our Estimate to that of Rao(1986)	Ratio of Our Estimate to that of Rao(1992)	Rao (1986) (million Geary Khamis $)	Our Estimate (million Paasche $)	Ratio of Our Estimate to that of Rao
	Feed and Seed					Non-Agricultural Inputs		
Argentina	867	999	1,422	1.64	1.42	960	961	1.00
Brazil	2,418	2,689	2,999	1.24	1.12	1,181	2,298	1.95
China	5,046	10,312	13,582	2.69	1.32	n.a.	3,882	n.a.
India	2,443	4,145	5,222	2.14	1.26	6,015	1,919	0.32
Indonesia	199	365	366	1.84	1.00	180	483	2.68
Korea	125	279	302	2.42	1.08	162	522	3.22
Mexico	845	1,117	1,176	1.39	1.05	2,729	1,842	0.68
France	3,095	3,701	5,088	1.64	1.38	7,522	4,479	0.60
Germany	2,579	3,583	5,658	2.19	1.58	5,909	3,209	0.54
Japan	1,057	2,341	2,316	2.19	0.99	5,522	2,620	0.47
Netherlands	387	1,102	1,327	3.43	1.20	1,265	1,238	0.98
UK	1,438	1,969	2,215	1.54	1.13	1,995	2,587	1.30
USA	13,940	17,134	16,966	1.22	0.99	20,785	28,916	1.39

Source: Prasada Rao (1986), p.31 for col.1 and p. 96 for col.4, (1992) Table 5.4. Our estimates from Tables 2 and 6 above.

in the "economic accounts" than there is in most of the other items, because the depreciation rules vary between countries for fiscal reasons. Although the theoretical reasons for using a net valuation are unimpeachable, in practice we feel that this procedure is likely to lead to error. In our manufacturing studies we estimated capital stocks using standardised asset lives for each country, and from these one can derive more comparable estimates of capital consumption. An alternative way of bringing capital into the accounts, is to use such estimates to measure joint factor productivity as a supplement to the labour and land productivity measures. Where information is available on human capital it is also possible to augment the accounts to include human capital.

Van der Meer and Yamada measured labour input in terms of working hours rather than employment. This is clearly an advance on the procedure used in our study or by Prasada Rao. The main problem is that it is much more difficult to find source material on hours for most countries than it was for Japan, Netherlands, Taiwan and the USA. In their 26 country comparison they did not attempt to make such a measure. Nevertheless, the differences in agricultural working hours which they found are quite significant (1778 a year in Japan, 787 in the Netherlands and 2113 in the USA - see pp.175 and 188) and this is an area where further research is needed.

Table 11

Ratio of Gross Value Added to Gross Output in Agriculture in 1975

	Our Estimate (in Paasche $)	Prasada Rao (1986) (in Geary Khamis units)	Our Estimate in National Prices	V.der Meer & Yamada National Prices
Argentina	78.9	84.0	79.2	71.5
Brazil	77.6	83.4	78.7	87.7
China	84.5	n.a.	n.a.	n.a.
India	85.5	82.1	79.8	91.7
Indonesia	91.9	95.8	83.0	91.4
Korea	75.4	91.1	75.1	81.6
Mexico	66.6	57.1	66.9	65.9
France	55.8	50.5	57.9	62.1
Germany	44.5	43.1	41.0	54.3
Japan	60.5	47.3	54.8	61.1
Netherlands	56.6	68.8	60.8	50.8
UK	52.0	63.5	52.8	45.8
USA	50.6	62.0	50.6	49.9

Source: First two columns derived from Table 9 above, third column from Tables 1 and 6 above, fourth column from van der Meer and Yamada (1990), pp.171-2.

Table 12

Gross Value of Farm Output in 1975: Our Measure and that of Economic Accounts
(million units of national currency)

	Our Method	Economic Accounts	Our Estimate as Percent of Accounts
Brazil	173,311	140,537a	123
India	404,993	342,175	118
Indonesia	3,470,260	3,730,400	93
Korea	2,294,940	2,645,420	87
Mexico	121,712	160,408a	76
France	118,471	128,999	92
Germany	51,174	50,295	102
Japan	8,721,990	9,719,700	90
Netherlands	17,881	18,539	96
UK	4,926	4,768	103
USA	92,863	92,878	100

a) National accounts. For Mexico the FAO farm account figure was 153,776.

Source: Column 1 from our Table 1. Column 2 derived from FAO economic accounts worksheets supplied by FAO in 1983. The Brazilian national accounts worksheets of the Vargas Foundation were supplied by Maria Alice de Gusmao Veloso. Mexican national accounts from SPP/Bank of Mexico, Sistema de Cuentas Nacionales de Mexico, Vol.II, January 1981.

Van der Meer and Yamada make much greater use of the "economic accounts" for agriculture than most other studies we have cited (except that of Terluin). However, we have strong doubts about the usefulness of a general switch from our "commodity" approach to measurement of gross output, feed and seed, towards their "accounts", given the present state of ignorance about the way in which such accounts are compiled and their compatibility with FAO commodity information.

The problem with using their approach as a general multi-country procedure is that the FAO farm accounts are not available for all countries; they vary in commodity coverage, and in the pricing conventions which they use, in ways that are not always explicit. It would clearly be risky to use FAO's price information to divide into the economic accounts valuations in order to derive intercountry estimates, as the FAO prices may well be different from those embedded in the farm accounts.

The van der Meer-Yamada technique is not the only way of dealing with the coverage problem. There are more direct ways of dealing with deficiencies in the coverage of FAO's commodity estimates. They can be supplemented by estimates for missing items. However, van der Meer and Yamada have put their finger on a weakness in our estimates which is not easy to remedy.

Van der Meer and Yamada suggest that our commodity approach tends fairly systematically to understate gross output compared with that in the agricultural accounts (see their pp.181-2). This is true in Japan and the Netherlands in which they were most interested, and the difference was probably due to the reasons they identify. However, in some cases our method produced significantly higher estimates than the farm accounts. In Brazil our estimate was 24 per cent higher and in India 18 per cent (see Table 12).

In the case of Brazil, the national accounts included some items we had omitted, notably the increase in the size and value of livestock herds, the increase in the stock and value of coffee trees, and a small item (about 0.2 per cent of output) for flowers. Together these three items amounted to 14.6 billion cruzeiros. However, this was more than offset by discrepancies arising from differences in the quantities and prices for individual items. The biggest discrepancy was for coffee, where the Brazilian price was about a fifth of that recorded by FAO and production was twice as high. If the Brazilian authorities had valued coffee at the FAO price, their total output would have been 49.6 billion cruzeiros greater. For Brazil, unlike the other countries in our sample, the FAO prices for 1975 were nearly all estimates. Errors in Brazilian prices are not a problem for our volume estimates as we valued all output at US prices, but the differences in the quantity estimates are disconcerting. As there was an agricultural census for Brazil in 1975, on which the national accounts estimates are based, the latter are obviously more reliable than the estimates of FAO. Our estimate for Brazil must therefore be regarded as weak.

In India, the national accounts for agriculture are published in more detail than for most countries, and were identical with the FAO farm accounts. They include some small items we omitted, e.g. straw, ghee and increases in the value of livestock, but these differences in item coverage are not a major source of discrepancy. The Indian authorities supplied their quantity and price estimate for 33 crops which we could check with the

FAO commodity data. There were discrepancies in both directions for both prices and quantities, but a major difference was for rice where the FAO production estimate was nearly 25 million tons (tonnes) higher than that of FAO. If the Indian authorities had used the FAO quantity estimate their output would have been raised by about 40 million rupees. Here again we must assume that the national accounts estimate for rice was better than that of FAO.

In Mexico, the national accounts give considerable detail by value of commodity but not by quantity. The national accounts figure for gross output was 160 billion pesos (excluding agricultural services). Of this total 10.8 billion consisted of items not included in our estimates (alfalfa, hay, other forrage, flowers and own account capital formation in livestock and crops). For wheat, rice and maize, the national account values were virtually identical with those we derived from FAO and for several other groups, the differences were not large. However, the national accounts estimates for vegetables and meat were both around twice as big as those we derived from FAO, and together they were big enough to explain the difference in the two sources. In our ICOP studies for manufacturing we found a systematic tendency in the Mexican national accounts to make large scale imputations for items not fully covered in censuses, and this also appears to be true for agriculture.

There is clearly a need to reconcile the commodity data of FAO with the valuations and the underlying quantitative and price information in the economic accounts for agriculture and in the national accounts.

Appendix A
Output in Forestry and Fishery

For forestry and fishing F.A.O. does not supply information on inputs, so we could only measure the gross output volume relatives and benchmark them on US gross value added in each of the two sectors. This procedure is equivalent to assuming that all countries had the same input-output coefficients as the U.S.A..

The F.A.O. Yearbook of Forest Products 1969-80 (1982), provides quantitative information on output of 12 categories of forest products. It gives export unit values but no domestic price information. We derived volume relatives using US export unit values as weights.

Estimates of the total volume of fish catch (in tons) were taken from the F.A.O. Food Balance Sheets (1980). No price information was available so we simply assumed that value added was proportionate to the ratio of total weight of the fish catch in the country concerned to that in the USA.

Table 13 shows our crude estimates of value added in forestry and fishing, together with agricultural value added and total value added for the three sectors combined.

Table 13
Gross Value Added in Agriculture, Forestry and Fishery in 1975
($ millions at 1975 U.S. prices)

	Gross Agricultural Value Added	Gross Value Added in Forestry	Gross Value Added in Fishery	Total Gross Value Added in the three sectors combined
Argentina	8,933	55	59	9,047
Brazil	18,303	963	197	19,463
China	95,496	1,377	1,759	98,632
India	41,963	805	595	43,361
Indonesia	9,631	804	355	10,790
Korea	2,524	268	546	3,338
Mexico	6,024	97	128	6,249
France	12,082	425	206	12,713
Germany(FR)	6,976	375	113	7,464
Japan	7,569	862	2,691	11,122
Netherlands	3,347	9	90	3,446
U.K.	5,197	53	255	5,505
U.S.A.	46,981	3,664	741	51,386

Source: Table 6 for column 1. Total combined value added of US forestry and fisheries output in 1975 from FAO Economic Accounts Questionnaire 1980/81. 1975 US value added in fisheries from Institute of Developing Economies, The Updated Input-Output Table of the USA - 1975, Tokyo, 1982.

Table 14

Output of Forestry per Hectare of Forest and Woodland in 1975

	Value Added in Forestry at U.S. rel. prices (mln. US $)	Forest and Woodland 1975 (1000 ha.)	Forest and Woodland as % of Total Land Area (%)	Forest Output Per Hectare of Forest Land (US $ct)	Forest Output Per Hectare of Forest Land (US=100.0)
Argentina	55	60,700	22.1	91	7.5
Brazil	963	510,000	60.3	189	15.7
China	1,377	151,800	16.3	907	75.4
India	805	67,400	22.7	1,194	99.2
Indonesia	804	121,400	67.0	662	55.0
Korea	268	6,628	67.5	4,043	335.9
Mexico	97	71,600	36.3	135	11.3
France	425	14,610	26.8	2,909	241.7
Germany	375	7,162	29.3	5,236	435.0
Japan	862	25,043	67.5	3,442	286.0
Netherlands	9	308	9.1	2,922	242.8
U.K.	53	2,020	8.4	2,624	218.0
U.S.A.	3,664	304,400	33.4	1,204	100.0

Source: Figures on forest and woodland and total land area from 1976 F.A.O. Production Yearbook (1977). Forest land and woodland refers to land under natural or planted stands of trees, whether or not they are productive.

Table 15

Labour Productivity in Agriculture, Forestry and Fishing in 1975

	Value Added in Agriculture, Forestry and Fisheries (mln. US $)	Employment in Agriculture, Forestry and Fisheries (000s)	Sectoral Employment as % of Total Employment (%)	Value Added Per Person Employed (US $)	Value Added Per Person Employed (USA=100.0)
Argentina	9,047	1,406	15.0	6,435	43.9
Brazil	19,463	13,256	37.4	1,468	10.0
China	98,632	293,410	77.7	336	2.3
India	43,361	161,439	66.6	269	1.8
Indonesia	10,790	29,378	62.6	367	2.5
Korea	3,338	5,773	44.7	578	3.9
Mexico	6,249	6,363	39.4	98~~3~~2	6.7
France	12,713	2,156	10.0	5,897	40.2
Germany(FR)	7,464	1,749	6.9	4,268	29.1
Japan	11,122	6,610	12.7	1,683	11.5
Netherlands	3,446	263	5.5	13,103	89.4
U.K.	5,505	687	2.7	8,013	54.7
U.S.A.	51,386	3,507	4.0	14,652	100.0

Sources: Employment for Argentina, Brazil, and Mexico supplied by ECLA; France, Germany, Japan, Netherlands, U.K. and U.S.A. from OECD, Labour Force Statistics (1970-1990); 1982 F.A.O. Production Yearbook(1983) for the remaining countries, except China which was taken from the Statistical Yearbook of China 1984, State Statistical Bureau, PRC, Economic Information and Agency, Hong Kong, 1984 (p.109 for labour force, adjusted to a mid year basis).

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